

**A NEW SPECIES OF *LEOTICHIVS* FROM BALI, WITH
NOTES ON IMMATURE STAGES AND HABITAT
(HETEROPTERA, LEPTOPODIDAE)**

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Abstract.—*Leotichius shiva* new species is described from the Kehen Temple at Bangli, Bali and compared with the two previously described species of *Leotichius*. The Bali habitat, shared with numerous ant lion larvae, consisted of very dry unconsolidated earth sheltered by the multiple roofs of the Hindu shrines. Nymphs of several instars are discussed and compared to other Leptopodomorpha.

In 1983 Ernst Heiss presented JTP with two *Leotichius* specimens that he had collected at the Kehen Temple at Bangli, Bali. During their National Geographic Society Expedition to the Malay Archipelago, J. T. and D. A. Polhemus visited this site and collected a good series of these insects, including the first known immatures. Not surprisingly these represent a new species which is described below.

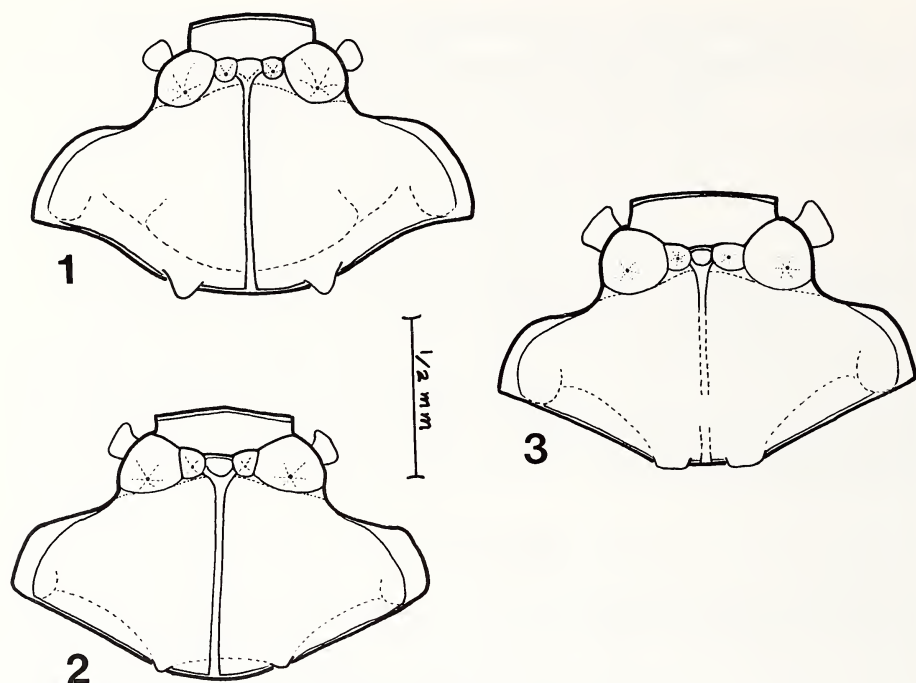
The genus *Leotichius* was established by Distant (1904) for his new species *L. glaucopsis* from Burma, and placed in the family Saldidae, subfamily Leptopinae (=Leptopodidae). The family Leotichiidae was erected by China (1933) to hold Distant's species, and later he (China, 1941) described a second species *L. speluncarum* from limestone caves at Gua Berang, Perlis Province, Peninsular Malaysia. Schuh and Polhemus (1980) placed *Leotichius* in the family Leptopodidae, subfamily Leptopodinae, a placement followed by Schuh, Galil and Polhemus (1987) in a world catalog of Leptopodomorpha. Habitat data were lacking for *glaucopsis*, but because *speluncarum* was found running on bat guano deposits in shallow caves, and no more specimens were collected during the more than forty intervening years between that collection and the present, it became accepted that *Leotichius* were cavernicolous. The discovery of these insects on Bali suggests that their preferred habitat is fine dry soil sheltered from rain, and in Bali at least shared by the larvae of xeric adapted Neuroptera. Their occurrence in cave mouths would thus be expected due to the sheltered nature of that habitat.

One specimen of *Leotichius*, species unnamed, is known from Thailand, but there is no habitat data (Pericart and Polhemus, 1990).

***Leotichius shiva*, new species**

Figs. 2, 4-12

Diagnosis. *Leotichius shiva* is closely related to *L. glaucopsis* and *speluncarum*. It differs from *speluncarum* by the more lateral position of the tubercles on the posterior



Figs. 1-3. Pronota of *Leotichius* spp. 1. *L. glaucopis*. 2. *L. shiva*. 3. *L. speluncarum*.

margin of the pronotum, different dark banding on the legs, more strongly raised scutellar apex, and from both species by the spatulate spines ventrally on the fore and middle femora. *L. glaucopis* differs from both of the other species by the longer first and second antennal segments, more sharply angled and more posteriorly located humeral pronotal angles, and other characters as noted by China (1941).

We have studied the holotype of *Leotichius glaucopis* Distant and a paratype of

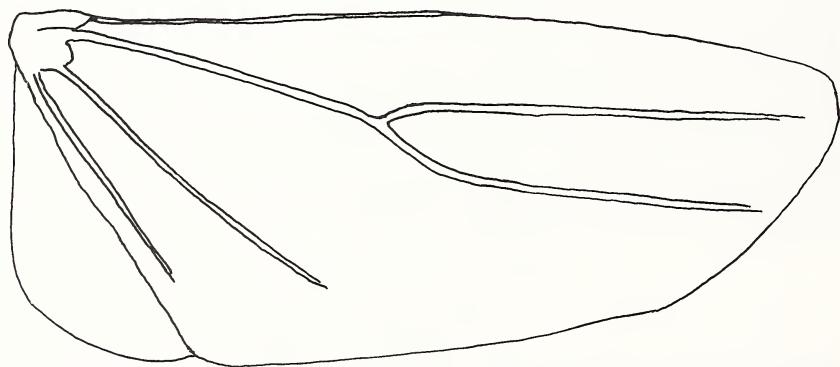
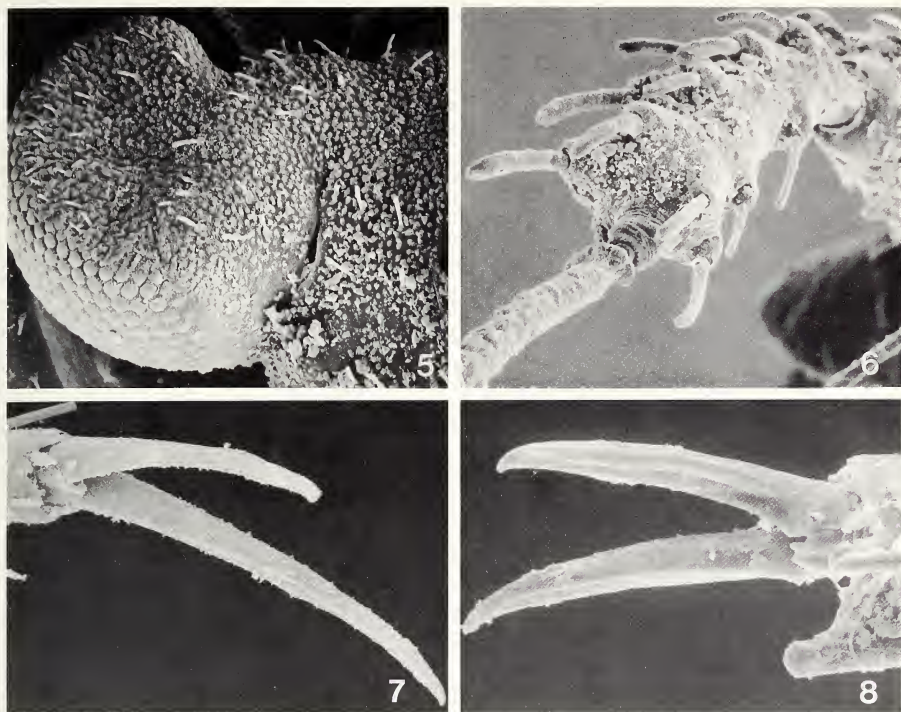


Fig. 4. Hind wing, *L. shiva*.

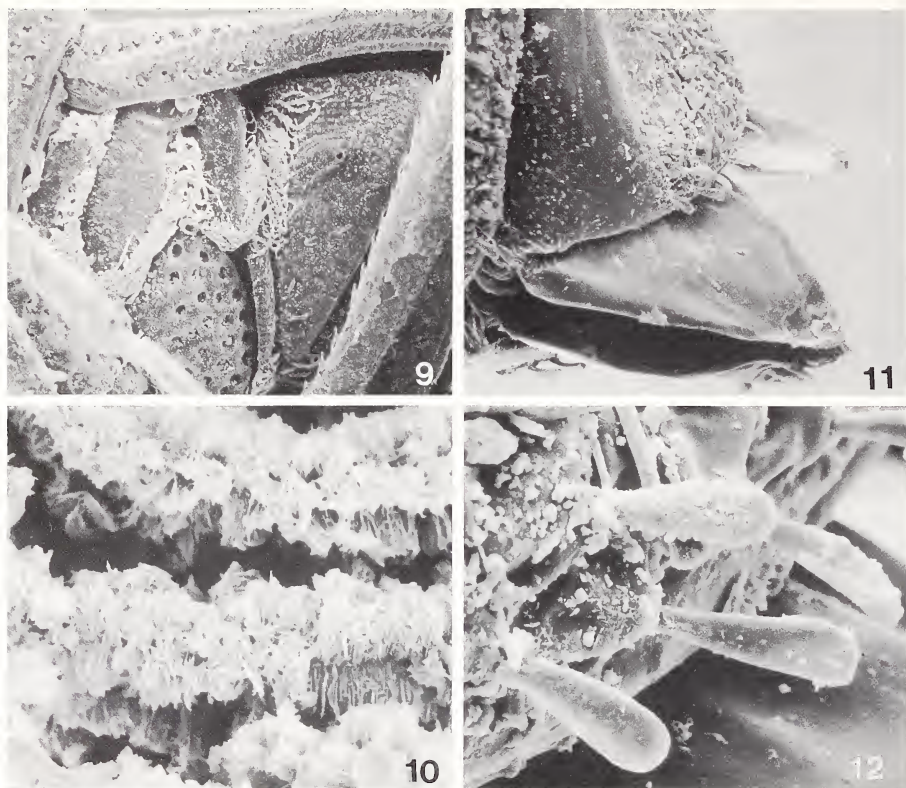


Figs. 5–8. Scanning micrographs, *L. shiva*. 5. Dorso-frontal view of left side of head, fifth instar nymph. 6. Antennal segments 3 and 4. 7. Lateroventral view of pretarsus, early instar nymph. 8. Lateroventral view of tarsus, adult.

Leotichius speluncarum China in order to construct Table 1 that illustrates differences between the known species. Both of these specimens, located in the British Museum (Natural History), are in rather poor condition.

Description. Macropterous male (all measurements in mm): Ground color yellowish brown, head above eyes, most of scutellum, three broad fasciae along costal margin (basal, medial, distal), fuscous to piceous; broad areas on pronotum and hemelytra variably infuscated; membrane weakly infuscated basally and medially. Legs leucine to testaceous, each femur with a subapical brown annulus with width equal to diameter of femur; femora and tibiae distally dark. Venter of abdomen, head and anterior part of pronotum, coxae, brown. Venter of head and prothorax, all ventral thoracic sutures and margins with a thick build up of cotton-like substance (Figs. 9, 10).

Structural characteristics: Base of head, prothorax except ventral area behind head, hemelytra except membrane, acetabulae, densely, regularly punctate (areolate). Head short, more than twice as wide as long in middle; frons, ventral area between hind margin of eyes and thorax set with thickened blunt setae; eyes very large, strongly exserted; non-functional dorsally, with tubular setae (Fig. 5); ocelli prominent, set on strongly raised tubercle. Antennae moderately long, segments 1 and 2 stout,



Figs. 9–12. Scanning micrographs, *L. shiva*. 9. Lateral view of meso- and metathorax. 10. Detail of cottony substance shown in Figure 9. 11. Lateroventral view of female terminal abdominal segments, including ovipositor. 12. Detail of clubbed setae in Figure 11.

segments 3 and 4 slender (Fig. 6); segment 1 with 2 long stout setae; segments 1 and 2 with numerous short, thickened setae (Fig. 6); length of segments I–IV: 0.43, 0.36, 0.29, 0.43. Pronotum short, broad, strongly narrowed anteriorly, with a prominent longitudinal median carina; four tubercles (2 + 2) of calli prominent, strongly raised posterior margin rounded, with two (1 + 1) small tubercles adjacent to anterior angles of scutellum (Fig. 2); length on midline, 0.60. Hind wing with reduced venation (Fig. 4). Legs relatively slender, hind tibia distinctly sinuate. Forefemur slightly incrassate, armed beneath with two irregular rows of four or five stout spatulate setae, those of each row divergent; fore tibia armed beneath with a double row of divergent longer bristles. Middle femur armed beneath with a row of erect spines of varying lengths, and a second parallel row of very short spines; middle tibia armed beneath as fore tibia, dorsally with longer sub-erect spines. Hind legs only with short fine setae. Pertarsus with accessory parempodia and reduced parempodia (Fig. 8).

Proportions of legs as follows: Femur, Tibia, Tarsal 1, Tarsal 2: Anterior, 0.56, 0.50, 0.20, –; Middle, 0.70, 0.55, 0.13, 0.18; Posterior, 0.93, 1.15, 0.35, 0.25.

Table 1. Comparison of *Leotichius* species.

Character	<i>shiva</i>	<i>glaucopis</i>	<i>speluncarum</i>
Antennal ratio	10:8:14:12	10:8:16:12	12:10:17:13
Pronotum shape (lateral view)	tumid posteriorly	tumid posteriorly	not tumid posteriorly
Posterior pronotal tubercles	obsolete; located at anterolateral angles of scutellum	small; located mesad of anterolateral angles of scutellum	pronounced; located at anterolateral angles of scutellum
Pronotal longitudinal carina	pronounced	pronounced; keel-like	weak posteriorly
Lateral margins of scutellum	moderately raised	strongly raised; carinate	moderately raised
Scutellar apex	weakly compressed; weakly raised	strongly compressed; strongly raised	weakly compressed; not raised
Leg coloration (dark banding)	narrow subapical annulation	narrow subapical annulation	broad subapical annulation
Costal margin of hemelytra at membrane	continuous	continuous	disjunct
Venation of fore wing membrane	3 closed cells	3 veins	2 veins

Male genitalia as shown by China (1941:fig. 2) for *L. speluncarum*.

Length, 2.18 mm; width across pronotum 0.95 mm.

Macropterous female: Structure and coloration mostly as in male. Length, 2.33 mm; width, 1.05 mm. Ovipositor externally as in Fig. 11.

Description of immatures: A number of females were dissected in an effort to obtain ripe ovarian eggs, without success. Only one poorly formed egg was found, suggesting that these insects may have a distinct breeding season restricted to the rainy season with higher humidity.

Eyes: In a third instar nymph, the earliest available, the dorsal flattening of the eyes is already apparent, and is accentuated in later instars. The ommatidia are not formed dorsally, but instead the long basal part of the laterally directed ommatidia are visible, lying parallel to the dorsal surface just beneath a thickened but still transparent dorsal cuticular covering (Fig. 5).

Antennae, legs: The nymphal antennae and legs are similar to the adults in shape and complement of setae and spines. The single segmented tarsi are without visible pretarsal structures, except two long claws (Fig. 7).

Abdomen: Spiracles are present ventrally on the laterotergites of abdominal segments 2–8; the first abdominal spiracle lies along the hind coxae. On sternum 2 just caudo-medially from the first abdominal spiracle, a small opening underlain by bright pink tissue suggests the presence of an active gland, possibly homologous with the larval organ of Saldidae (see Cobben, 1957; Polhemus, 1985).

The posterior margin of each abdominal tergum is set with a row of spines. A single abdominal scent gland is located on the anterior margin of tergum four, with

a small obscure opening, not underlain by orange or pink glandular tissue, indicating that this gland may be non-functional.

Material examined. Holotype, male: INDONESIA, Bali Prov., Bali, Bangli, Kehen Temple, October 17, 1985, CL 2169, J. T. and D. A. Polhemus (AMNH).

Paratypes: INDONESIA, Bali: many males, females, same data as holotype (JTPC, AMNH, USNM, MZB, BMNH); 1 male, 1 female, same locality as holotype, July 28, 1980, Ernst Heiss (JTPC).

Additional specimens: Numerous nymphs, same data as holotype (AMNH, JTPC, USNM).

Etymology. The name *shiva*, a noun in apposition, refers to the Hindu god Shiva, creator and destroyer of worlds.

Habitat data. The type locality at Bangli consists of Hindu temples set on a raised terrace against a sloping forested hillside. The largest shrine is that of Shiva with 11 roofs, one over the other, sheltering a raised platform having a surface of unconsolidated desiccated earth; other adjoining temples of lesser gods are of the same design but with fewer roofs. The desiccated earth of these temples, pocked with conical ant lion pits, was the only place that *Leotichius* was seen, although dry but unsheltered earth in the vicinity was searched. This microhabitat and the only other one previously documented for these bugs (on bat guano in a limestone cave) suggests that a completely dry sheltered environment is a habitat requirement.

Discussion: The hind wing venation (Fig. 4) is quite reduced, but not as drastically as depicted by China (1933, fig. 2b) for *Leotichius glaucopis*. Following the latest interpretation of heteropteran wings by Wootton and Betts (1986), the primary venation in the medial region seems to be R + M bifurcated distally. This venation is similar to that of *Valleriola*, but in the latter R + M is shifted somewhat anteriorly. In *Erianotus lanosus* (Dufour), illustrated by Pericart and Polhemus (1990), R + M is shifted anteriorly almost to the wing margin, and probably misinterpreted, as Cu should probably be labelled M (the reduced venation of Leptopodidae is difficult to homologize). The venation of all of these is strikingly different than that of Saldidae (see: Davis, 1961:fig. 17; Polhemus, 1985:fig. 16E). In all Leptopodomorpha studied so far M and R diverge distally, whereas in all Nepomorpha studied, M and R converge and fuse distally [*Potamocoris robustus* La Rivers, *Ochterus barberi* Viets Schell (J. T. Polhemus, unpubl.); *Curicta carinata* Kuitert (Keffer, 1991:fig. 16); *Lethocerus americanus* (Leidy), *Notonecta undulata* Say (Davis, 1961:figs. 18, 20)]. This suggests that synapomorphies may be found in patterns of hind wing venation.

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the U. S. National Museum of Natural History, Washington (USNM), British Museum (Natural History) (BMNH), Museum Zoologicum Bogoriense, Bogor (MZB), and the J. T. Polhemus collection (JTPC).

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